

CLAIMS:

What is claimed is:

1. A method of managing operation of a locomotive that moves between at least two operating areas, said locomotive having at least two profiles of operation, said locomotive traveling along a path comprised of at least two operating areas, each operating area having at least one location profile associated therewith, with the location profile of one operating area being different from that of a second area, said method comprising:
monitoring a location of the locomotive to determine its operating area; and
controlling an operation of the locomotive as a function of the determined operation area and the associated location profile, said location profile being selected from the group comprising a security profile and an emissions profile, wherein said security profile includes a restriction on an operation of the locomotive based on its position relative to a security control area, and wherein said emissions profile includes a restriction on an operation of the locomotive based on its position relative to an emission control area.
2. The method of claim 1 further including managing a plurality of locomotives operating in an operating area to manage total emissions of all locomotives within the operating area.
3. The method of claim 1 wherein one of the location profiles is a security profile, said security profile includes a restriction on an operation of the locomotive while traveling on a portion of the path located relative to a security control area.
4. The method of claim 3 further including managing a plurality of locomotive operating in an operating area to manage total emissions of all locomotives within the operating

area, wherein one of the operating areas is a security control area, said security control area having said security profile associated therewith.

5. The method of claim 1 wherein the security profile of operation includes a valid security authorization parameter required by an operator of the locomotive, further comprising receiving a security authorization input from a particular operator of the locomotive and comparing the security authorization input received from the particular operator to the required security authorization parameter to determine if the received security authorization input is valid, and wherein the operator is allowed to operate the locomotive when the received security authorization parameter is valid.
6. The method of claim 5 wherein the security authorization input is received either from a particular operator located on-board the locomotive or from a particular operator located off-board the locomotive.
7. The method of claim 5 wherein receiving the security authorization input of the particular operator comprises receiving a security authorization input from a card key presented by the particular operator.
8. The method of claim 5 wherein controlling an operation of the locomotive comprises restricting or inhibiting an operation of one or more components of the locomotive when the received security authorization input of a particular operator does not match the required security authorization parameter of the security profile.
9. The method of claim 5 wherein the operator is an administrative system or device located on-board the locomotive or off-board the locomotive.
10. The method of claim 1 wherein a first operating area has a first profile of operation and a second operating area has a second location profile, further comprising changing

the location profile of the locomotive from the first location profile to the second location profile when the locomotive changes to the second operating area from the first operating area.

11. The method of claim 1 further comprising monitoring an operating characteristic of the locomotive, said operating characteristic being representative of one or more operations of the locomotive, said controlling an operation of the locomotive is a function of the operating characteristic.
12. The method of claim 1 wherein a second locomotive is operably coupled in a consist configuration with the locomotive, further comprising controlling an operation of the second locomotive as a function of the determined operation area and the associated location profile of the first locomotive.
13. The method of claim 1 further comprising monitoring an operating characteristic of the locomotive, said operating characteristic being representative of one or more operations of the locomotive, said controlling an operation of the locomotive is a function of the operating characteristic.
14. The method of claim 13 wherein an operating characteristic of the locomotive is selected from the list of: throttle setting, engine speed, fuel mixture, mechanical braking, air braking, automatic braking, engine cooling, energy storage, engine firing, hybrid energy use, dynamic braking, emission output, and tractive effort.
15. The method of claim 1 wherein controlling an operation of the locomotive includes controlling one or more operations of the locomotive from the list: throttle, reverser, tractive effort, air braking, electronic mechanical braking, dynamic braking, engine speed, engine operation, engine load, and motoring profile.

16. The method of claim 1 wherein the emission profile defines one or more emission levels or characteristics of the locomotive.
17. The method of claim 1 wherein the emission profile defines one or more emission levels or characteristics for a plurality of locomotives.
18. The method of claim 17 wherein one of the operating areas is an emission control area, and wherein managing the operation of a plurality of locomotives includes operating each of the plurality of locomotives as a function of a location of the plurality of locomotives and an emission characteristic of one or more of the plurality of locomotives, the method comprising:
 - determining a location for each of the plurality of locomotives;
 - determining the emission characteristic for each of the one or more plurality of locomotives having a determined location within the same emission control area;
 - monitoring an emission parameter of each of the one or more plurality of locomotives determined to be within the same emission control area;
 - determining a control parameter as a function of the determined location of the one or more plurality of locomotives and as a function of the monitored emission parameters and the determined emission characteristics; and
 - controlling an operation of the each of the one or more plurality locomotives responsive to the control parameter.
19. The method of claim 18 wherein controlling includes calculating, tracking, managing and trading emissions credits for each of the one or more plurality of locomotives within the emission control area.
20. A method of secure operation of a locomotive as a function of a location of the locomotive and a security parameter of the locomotive, the method comprising:
 - determining the location of the locomotive;

determining the security parameter for the locomotive as a function of the determined location of the locomotive;
receiving a security authorization input from an operator of the locomotive;
determining a control parameter as a function of the location of the locomotive and the comparison of the received security authorization input from the operator and the determined security parameter; and
controlling an operation of the locomotive responsive to the control parameter.

21. The method of claim 20 further comprising providing one or more alert notifications when the received operator security authorization input does not match the security authorization parameter and the operator initiates a change in an operating parameter, said operating parameters including a motoring parameter or releases braking parameter motoring or releases braking of the locomotive, and wherein said alert notifications including one or more of the following:

sounding an audible alarm;
generating an e-mail;
generating a computer message;
initiating a telephone call; or
initiating a page.

22. The method of claim 21, further comprising displaying information on a display when the received operator security authorization input does not match the security authorization parameter and the operator initiates a change in an operating parameter, said operating parameters including a motoring parameter or release braking parameter, the displayed information prompting the operator to initiate a security authorization process.

23. The method of claim 21, further comprising recording input data when the locomotive security control system initiates a security alert condition and the operator initiates motoring or releases braking.
24. The method of claim 21, further including overriding an operator command entered by an operator or an administrative system when the received operator security authorization input does not match the security authorization parameter.
25. A method of controlling emissions resulting from operation of a locomotive as a function of a location of the locomotive and an emission characteristic of the locomotive, the method comprising:
 - determining the location of the locomotive;
 - determining the emission characteristic for the locomotive as a function of the determined location of the locomotive;
 - monitoring an emission parameter of the locomotive;
 - determining a control parameter as a function of the location of the locomotive and as a function of the monitored emission parameter and the determined emission characteristic; and
 - controlling an operation of the locomotive responsive to the control parameter.
26. A security system for secure operation of a railroad locomotive as a function of a location of the locomotive, the system comprising:
 - a location unit determining the location of the locomotive;
 - a memory storing two or more operating profiles of the locomotive, a geographically defined operating area, and a security authorization parameter, and computer instructions;
 - an authorization input device for receiving a security authorization input from an operator of the locomotive;

a processor executing the computer instructions stored in the memory, determining the operating profile of the locomotive as a function of the location of the locomotive as compared to the operating area stored in memory, and comparing the received operator security authorization input to the security authorization parameter, the processor generating a signal indicative of security alert when the received operator security authorization input does not match the security authorization parameter.

27 The system of claim 26 further comprising a communication unit transmitting the security alert signal to a control system and receiving a control parameter from the control system; and

a control unit controlling an operation of the locomotive responsive to the received control parameter.

28. The system of claim 27, further comprising a receiving unit for receiving the signal indicative of the security alert condition from a control system, and wherein the computer instructions configure the processor to output one or more commands to restrict or inhibit an operation of the locomotive when a signal indicative of a security alert condition is received

29. The system of claim 28, further comprising computer instructions configuring the processor to output an engine shutdown command when the signal indicates the security alert condition.

30. The system of claim 28, further comprising the computer processor including an input for receiving a command from an operator of the locomotive, the computer instructions further configuring the processor to disregard the operator command in response to computer instruction when the signal indicates the security alert condition.

31. The control system of claim 28 wherein the computer instructions configure the processor to disregard the operator command received from the operator if the operator initiates motoring when the signal indicates the security alert condition.
32. The control system of claim 28 wherein the computer instructions configure the processor to normally output a motor command to the engine control hardware when the operator initiates motoring, and further configure the processor to withhold the motor command when the signal indicates the security alert condition.
33. The control system of claim 28, further comprising an audible alarm for providing an audible alarm signal in response to an alarm command from the processor, the computer instructions configuring the processor to output the alarm command when the signal indicates the security alert condition and the operator initiates motoring or releases braking.
34. The control system of claim 26 wherein the computer instructions configure the processor to record fault data in the memory device when the signal indicates the security alert condition.
35. The control system of claim 26, further comprising a display device for displaying data received from the processor, the computer instructions further configuring the computer processor to send data indicating the occurrence of a security alert condition to the display device when the signal indicates the security alert condition and the operator initiates motoring or releases braking.
36. A system for secure operation of a locomotive as a function of a location of the locomotive and a security parameter of the locomotive, the system comprising:
a control unit controlling an operation of the locomotive responsive to a control parameter;

a location unit determining the location of the locomotive;
a communication unit transmitting the determined location of the locomotive and receiving the control parameter;
a communication interface receiving the transmitted location of the locomotive and transmitting the control parameter to the locomotive; and
a processor determining the security parameter and determining the control parameter as a function of the location of the locomotive and the determined security parameter.

37. The system of claim 36, further comprising:

a monitor unit monitoring an operational parameter of the locomotive, said communication unit transmitting the operational parameter of the locomotive, said communication interface receiving the operational parameter, said processor determining the security parameter as a function of the operational parameter and determining the control parameter as a function of the operational parameter.

38. The system of claim 36, further comprising:

an alerting module, said alerting module providing an alert message or signal when the security parameter is indicative of a security alert condition.

39. The system of claim 36, further comprising:

a memory storing location data, the location data defining a railway track network and a security control area, said security control area representing a subset of the track network and being defined by a geographic boundary, said processor determining the control parameter as a function of the location of the locomotive and the security control area.

40. The system of claim 39 wherein the processor determines a second control parameter when the location of the locomotive changes relative to the boundary of the security control area, the control unit being responsive to the second control parameter.

41. The system of claim 36, further comprising:

a reporting module configured to report data representing the security parameter of the locomotive as a function of the location of the locomotive.

42. The system of claim 36 wherein controlling the operation of the locomotive comprises controlling an engine speed, a throttle setting, air braking, electronic mechanical braking, dynamic braking, and tractive effort.

43. The system of claim 36 wherein the communication interface and processor are located at a remote control system, and wherein a plurality of locomotives are each configured with the control unit, location unit and communication unit, the communication interface receiving a plurality of determined locations from the plurality of locomotives.

44. The system of claim 36 wherein the location unit is a global positioning system (GPS) receiver receiving GPS positioning data from GPS satellites and determining a location as a function of the received GPS positioning data.

45. A system for controlling engine emission resulting from operation of a locomotive as a function of a location of the locomotive, the system comprising:

a location unit determining the location of the locomotive;
a monitor unit monitoring an emission parameter of the locomotive;
a processor determining an emission characteristic of the locomotive as a function of the location of the locomotive, and determining a control command as a function of the monitored emission parameter and the emission characteristic; and

a control unit controlling an operation of the locomotive responsive to the received control parameter.